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## Some Lactarii from Windham County, Vermont

GERTRUDE SIMMONS BURLINGHAM

Vermont is undoubtedly one of the richest of the New England states in the number and variety of its fleshy fungi; yet with the exception of the lists of Charles C. Frost,\* and a paper by Professor Burt,† nothing has been published to indicate any extended study of the higher *Basidiomycetes* which occur in the state. In connection with a special study of the genus *Lactarius*, it was my fortune to spend last summer collecting in that portion of Windham county, Vermont, immediately north of the region explored by Frost. Six miles west of Newfane village, at an elevation of about 500 meters, we "pitched camp" in a small farmhouse delightfully situated in the midst of the fragrance and the sunshine and the bird voices of the mowing,‡ while closely encircling it on three sides was the forest with the more subtle odors, the cool shade, and the songs of the veery and the hermit thrush. Although the most extensive field work was done in the town of Newfane, several excursions were made into the neighboring townships reaching west to Stratton Mountain, and east to Putney Mountain, including a range of elevation from 180 to 615 meters.

The topography of the region is characterized by a succession of hill-like mountains with intervening valleys traversed by some small stream whose waters finally reach the larger valley of the West River. The elevations are mostly covered with timber, and lower lands which were tilled two generations ago are, in some cases, being reclaimed by the forests. Except along the Connecticut and the lower valley of the West River, chestnut groves are lacking. There are a few scattering oaks, but no rich oak woods. The white pines, too, are scarce in this part of Vermont,

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\* Tuckerman and Frost. Catalogue of plants within thirty miles of Amherst College. 1875.

† Key to the genera of the *Basidiomycetes* of Vermont. 1899.

‡ "Mowing" is used in New England for any land from which hay is cut, while the term "meadow" is restricted to level and usually moist grass lands.

but the young trees grow rapidly where given an opportunity. Forests of balsam fir, spruce, and hemlock are numerous. The deciduous woods are made up principally of maples, beeches, yellow and paper birch, and aspens. Along small streams, alders abound. The soil is a loam or a sandy loam, with a topsoil of vegetable mold in the less steep and rocky woods.

From the middle of July to the middle of September the weather was unusually dry. Consequently there was a scarcity of the *Lactarii* except in naturally moist woods, and in wooded ravines. The swamps were not as a rule good collecting grounds, owing to the fact that they were so often supplied by cold springs. Nevertheless the region, with its varying elevations, diverse forest conditions, and shaded ravines, proved a most fruitful collecting field. During July and August, after a light rain or even a heavy dew, *Boleti* and *Russulae* were very abundant in the more open places in the woods; by the middle of August the *Cortinari* began to be plentiful; and from first to last many other genera were represented by a lesser number of species. But in the present paper I shall attempt to cover merely the summer's work upon the genus *Lactarius*.

The absence of *Lactarius piperatus* was notable, but the related form, *Lactarius deceptivus* Peck, was very common throughout the region. Two species were found which have not been reported before in the United States; namely, *Lactarius resimus* Fr.,\* and *Lactarius circellatus* (Batt.) Fr. *Lactarius rimosellus* also should be mentioned as a species recently described by Dr. Peck (Rep. State Bot. N. Y. 1905: 37. 1906). *Lactarius oculatus*, which was described by Peck as a variety of *Lactarius subdulcis*, is here separated as a distinct species, since the Vermont specimens were so plainly viscid when moist.

Many thanks are due Dr. Charles H. Peck for the privilege of examining the type specimens in the herbarium of the New York

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\* In the Rep. State Bot. N. Y. for 1872, Peck describes *Lactarius regalis*, which, in the Rep. State Bot. N. Y. for 1884 and 1885, he refers to *Lactarius resimus* as a variety. The type specimens show the plant in various stages including forms young enough to have tomentum on the margin. From the absence of this tomentum in the five type specimens, it would seem that they belong to a distinct species as first described; but further collections of this form must be made before its position can be positively determined.

State Museum, and for his assistance in determining doubtful forms; also to Prof. L. M. Underwood, under whose direction the study of the *Lactarii* is being pursued, and Dr. Marshall A. Howe, who placed at our disposal for the summer the house which we occupied, and otherwise rendered valuable assistance through his intimate knowledge of Newfane.

The following is the list of species taken, together with the description of new species.

***Lactarius aspidioides* sp. nov.**

Pileus fleshy, rather firm, convex-umbilicate, then plane, becoming infundibuliform with age, 3–4.5 cm. broad, sulphur-yellow zoned with deeper yellow, zones narrow, sometimes obscure, very viscid when wet, gluten thick and persisting, margin involute and minutely tomentose at first; gills whitish then cream-colored spotted with yellow, close, sometimes forking next the stem, adnate but acute at the inner end, 4 mm. broad, staining lilac where wounded; stem sulphur-yellow, often spotted with deeper yellow, viscid when young or wet, equal or abruptly smaller at the base, glabrous, stuffed, becoming hollow, 2–3.5 cm. long, 6–10 mm. thick; spores white, globular to broadly elliptical, echinulate, 5–7 by 7–8  $\mu$ ; flesh whitish, changing faintly lilac where exposed to the air; milk white, a change in color indicated only by the change in the color of the broken flesh; taste bitter.

In a grassy place in hillside sheep-pasture near small fir trees, 523 m. elevation, after heavy rain and warm weather, September 21–24; Newfane.

This species is related to *Lactarius aspidius* Fries, but is separated from it by the brighter-colored *zoned* pileus, the smaller size, and the bitter taste of the milk. I could not detect any change in the color of a drop of milk, but the gills and flesh change to lilac where wounded. The tomentum on the margin of the young pileus is chaffy in appearance.

***Lactarius Bensleyae* sp. nov.**

Pileus firm, fleshy, nearly flat with margin inrolled, papillate, when older depressed in the center but the margin still recurved, surface covered with a dense minute short rather stiff pubescence, dry, blue-black when young and moist, then zoned with dark-gray, finally with brownish-gray, darker in the center, 2–15 mm. broad; gills whitish, some forking near the stem, close, slightly decurrent; stem somewhat buff, covered more or less with a gray

pruinosity, glabrous, dry, nearly equal, becoming hollow, 1 cm. or less in length, 2–3 mm. thick; spores slightly cream-colored, mostly globular, some slightly elliptical, echinulate, 5–6.5  $\mu$  or rarely 6.5 by 8  $\mu$ ; flesh of pileus gray, of stem buff; milk white, unchanging, acrid.

In black soil in a wet place at times overflowed, under yellow birch and young spruce woods, 500 m. elevation, July to September; Newfane, Agnes H. Bensley.

This species is gregarious and sometimes cespitose. As many as 35 were found growing in an area of less than one square foot. It can be distinguished from *Lactarius griseus* Peck, by its minute size, its dark-colored and frequently zoned pileus, and by the short and dense hirsute-pubescent covering of the pileus.

***Lactarius isabellinus* sp. nov.**

Pileus fleshy, not very thick, convex, then broadly convex, at length infundibuliform, umbonate, dry, glabrous, but a little roughened and wrinkled in the center especially when mature, azonate, red-fulvous in the center, buff toward the margin, all fading to buff when mature, 3–4.5 cm. broad; margin glabrous, even or faintly striate when old, and sometimes areolate-wrinkled; gills pale-yellowish, becoming reddish where bruised, crowded, thin, forking near the stem or midway to the margin, slightly decurrent, 3 mm. broad, or twice as broad as the thickness of the flesh; stem the same color as the pileus, equal or slightly tapering upwards, tomentose at the base, stuffed, becoming hollow, 4 cm. long, 6 mm. thick; spores white, slightly echinulate, 6–7.5 by 7–8.5  $\mu$ ; flesh white, staining yellowish from the milk; milk white, at length (after five minutes) becoming sulphur-yellow, astringent, then acrid, abundant.

In leaf mold, moist open place in mixed woods, 460 m. elevation, warm dry weather, September; Newfane.

The milk changes color slowly, and sometimes a drop will not seem to change, but the milk always dries yellow on the flesh. The species was found but once; then, however, several specimens in various stages of development.

***Lactarius minusculus* sp. nov.**

Pileus fleshy, thin, broadly convex, with a small umbo, becoming plane then somewhat depressed in the center, glabrous, viscid in wet weather, sometimes shining with viscosity, azonate, fulvous in the center, shading to cream-fulvous, then to cream on

the margin, 1.1–3 cm. broad, margin minutely crenate, pruinose at first, in mature specimens slightly wavy and sometimes substriate; gills close, thin, adnate, seldom forking, broad for the thickness of the pileus; stem slightly paler than the pileus, equal, stuffed, a little tomentose at the base when growing in moss, about 2.5 cm. long, 4 mm. thick; spores white, subglobose, slightly echinulate, 6–8  $\mu$ ; flesh isabelline-white; milk white, unchanging, acrid.

In moss or on decayed wood, under yellow birches, in cool, moist woods, 500 m. elevation, July; Newfane.

This species resembles *Lactarius subdulcis* somewhat, but differs in its smaller size, the viscosity of the pileus, the crenate margin, in being expallent, and in the acrid milk. The plants were found in the same general locality several times in July, always after a rain. Frequently the gills appear pruinose.

***Lactarius nitidus* sp. nov.**

Pileus fleshy, rather thin, convex then depressed in the center, margin arching for some time, umbonate, glabrous, smooth, shining-viscid when wet, mahogany-red, more golden-red toward the margin, umbo persistently dark, otherwise fading when dry, 3 cm. broad; gills yellowish becoming pruinose, close, sometimes forking, slightly decurrent; stem mahogany-red, equal, smooth, glabrous, stuffed becoming hollow, 4.5–5 cm. long, 5–8 mm. thick, sometimes ventricose when growing in wet places; spores white, echinulate, 5–6 by 6–8  $\mu$ ; flesh faintly buff, turning a little reddish where cut; milk white, unchanging, mild.

In a grassy sheep-pasture in the shade of hemlocks, and in woods, 500 m. elevation, warm weather, September; Newfane.

***Lactarius oculatus* (Peck) sp. nov.**

*Lactarius subdulcis oculatus* Peck, Rep. State Bot. N. Y. 1902 : 37. 1903.

Pileus fleshy, thin, convex then depressed in the center, margin arched then nearly plane, umbonate, viscid in dew or wet weather, glabrous, smooth, rich-fulvous in the center shading to buff-fulvous toward the margin, except the umbo fading to pinkish, 1.5–2.5 cm. broad, margin pruinose at first, slightly crenate; gills whitish then yellowish, at length pruinose, crowded, a few forking near the stem; stem buff at the top, sublatericeous below the middle, equal, stuffed, tomentose at the base, slightly sticky in wet weather, up to 6 cm. long, 5 mm. thick; spores white, broadly elliptical to

subglobose, echinulate, 6-7.5 by 8-9.5  $\mu$  ; flesh buff-whitish ; milk white, unchanging, mild.

In moss under pine and hemlock, 500 meters elevation, July to September ; Newfane.

"Pileus moist, subhygrophanous, vinaceous buff with a small central spot or umbo persistently reddish-brown or chestnut color. Otherwise like the species. Under spruce and balsam fir trees. September." Peck, Rep. State Bot. N. Y. 1902 : 37. *pl.* 83, *f.* 20-24. 1903.

Dr. Peck gave the name *oculatus* to the form on account of the eye-like appearance of the umbo in the mature or dry specimen. This spot is not noticeable in the moist condition. The viscosity of the pileus in wet weather, and the expallent color serve to separate it from *Lactarius subdulcis*.

In addition to the above, the following species were collected :

LACTARIUS AFFINIS Peck.

In moist fir or mixed woods with evergreens predominating, August to September, 500 m. elevation ; Newfane.

LACTARIUS ALPINUS Peck.

Mossy moist place on border of fir woods, September, 500 m. elevation ; Newfane.

LACTARIUS CAMPHORATUS (Bull.) Fr.

Common, July to September ; Wardsboro ; Stratton ; Newfane ; Putney. *Edible*.

LACTARIUS CINEREUS Peck.

Common in mixed woods, especially among beech leaves, most abundant in July and August ; Newfane.

LACTARIUS CIRCELLATUS (Batt.) Fr.

In cool mixed woods, spruce and fir and hemlock predominating, August to September, 500 m. elevation ; Newfane.

LACTARIUS DECEPTIVUS Peck.

Common especially under hemlocks, July to September ; Newfane. *Edible*.

LACTARIUS DELICIOSUS (L.) Fr.

Common in moist places in fir, spruce, or hemlock woods, July to September ; Newfane. *Edible*.

LACTARIUS FLEXUOSUS Fr.

Found twice under maples in leaves, rather dry, 500 m. elevation, September ; Newfane.

**LACTARIUS FULIGINOSUS** Fr.

Found in mixed woods several times but not common, 500 m. elevation, August ; Newfane.

**LACTARIUS GERARDII** Peck.

At foot of Stratton Mountain, under maple, balsam fir, and spruce, July, 615 m. elevation. *Edible*.

**LACTARIUS GRISEUS** Peck.

Common in wet woods on ground and on decaying wood, July to September, 180 to 615 m. elevation ; Stratton ; Newfane ; Putney.

**LACTARIUS HYSGINUS** Fr.

In grassy wood road and in both leaf and needle soil, under fir and hemlocks, moist woods, August to September, 500 m. elevation ; Newfane.

**LACTARIUS LIGNIOTUS** Fr.

Not common, a few scattering specimens, August to September, 500 m. elevation ; Newfane.

**LACTARIUS PALUDINELLUS** Peck.

In moist places in woods, found once ; Newfane.

**LACTARIUS PARVUS** Peck.

Found once on decayed wood in moist mixed woods, 500 m. elevation, September ; Newfane.

**LACTARIUS PYROGALUS** (Bull.) Fr.

Grassy open place in woods, 500 m. elevation, July ; Newfane.

**LACTARIUS RESIMUS** Fr.

Rare, found only one specimen, under spruce on edge of steep woods, 500 m. elevation, September ; Newfane.

**LACTARIUS RIMOSELLUS** Peck.

Found several times under beech among ferns, near wood road, July to August, 500 m. elevation ; Newfane. *Edible*.

**LACTARIUS SUBDULCIS** (Bull.) Fr.

Common in woods and on border of woods, especially in moist places, 180-615 m. elevation, June to September ; Stratton ; Newfane ; Putney.

**LACTARIUS SUBPURPUREUS** Peck.

In grassy sheep pastures with scattered firs, after heavy rains. 530 m. elevation ; September ; Newfane.



**LACTARIUS THEIOGALUS (Bull.) Fr.**

Common in spruce and hemlock woods, in both dry and wet ; weather, 180–500 m. ft. elevation, July to September ; Newfane.

**LACTARIUS TORMINOSUS (Schaeff.) Fr.**

Common in moist woods, sometimes nearly white, 500 m. elevation, August to September ; Newfane.

**LACTARIUS TURPIS Fr.**

Found three times in moist places ; twice in fir woods, once in maple woods near a pine tree, 500 m. elevation, August to September ; Newfane.

**LACTARIUS UVIDUS Fr.**

Common in *Sphagnum* in fir woods and under firs and alders in a wet ravine, 460 m. elevation, August, September ; Newfane. Several of the specimens were attacked by a fungus which affected the hymenium only and did not prevent the flow of milk. This has been deposited with Dr. Peck for identification and description.

**LACTARIUS VELLEREUS Fr.**

Mixed woods and under beech, 180 to 615 m. elevation, August ; Newfane.

**LACTARIUS VOLEMUS Fr.**

Found once in woods-road under maples and beeches, 500 m. elevation ; and once in a moist ravine near Newfane village, August. *Edible.*

The accompanying synopsis is offered as an aid in identifying the above-named species. In order to make the synopsis as complete as possible, I have included the additional species which are given in Frost's list, most of which were probably collected in the vicinity of Brattleboro. These added species are indicated by an asterisk. In his list the names of eleven new species occur which have never been described ; these are of course omitted.

### Synopsis of species

MILK BRIGHT-COLORED FROM THE FIRST, wounds often turning greenish.....	Section I.
MILK AT FIRST WHITE THEN CHANGING COLOR .....	Section II.
MILK WHITE AND UNCHANGING.....	Section III.

## I

- Milk orange; pileus some shade of orange zoned with darker, fading; gills deep-orange with yellowish reflections ..... *L. deliciosus*.  
 Milk saffron-yellow; pileus grayish-yellow, somewhat zonate; gills grayish-yellow; under pines..... *L. Chelidonium*.\*  
 Milk dark-red; pileus pale reddish-purple approaching Indian lake, fading, faintly zonate; gills dark-red, fading..... *L. subpurpureus*.  
 Milk indigo-blue; entire plant indigo-blue; pileus with grayish lustre, zonate; gills becoming yellowish ..... *L. Indigo*.\*

## II

- Milk becoming sulphur-yellow..... **A**.  
 Milk becoming salmon; at least wounds changing; pileus dry; spores yellow..... **AA**.  
 Milk becoming lilac; at least wounds changing; pileus viscid..... **AAA**.

## A

1. Pileus viscid ..... 2.  
     Pileus dry, fulvous in center, buff toward margin, all buff when mature; stem same color; gills paler; milk changes slowly... *L. isabellinus*.  
 2. Margin at first involute, tomentose; pileus whitish, azonate, large, umbilicate ..... *L. resimus*.  
     Margin glabrous or merely downy when young; pileus yellowish, salmon zoned with bistre or fawn more or less distinct; stem same color or paler; gills whitish to yellow, becoming reddish where bruised; milk bitter then acrid..... *L. theiogalus*.

## AA

- Pileus sooty or the color of coffee and milk, surface smooth, pruinose in appearance, 2.5-6.5 cm. broad; gills subclose..... *L. fuliginosus*.  
 Pileus more velvety-pruinose, center often wrinkled, umbonate, rich dark umber to sepia, 2.5-10 cm. broad ..... *L. ligniotus*.

## AAA

- Pileus and stem sulphur-yellow; pileus zoned with deeper yellow; stem equal or abruptly smaller at the base, viscid, sometimes spotted; plants small; milk bitter..... *L. aspidioides*.  
 Pileus pale brownish-gray or drab, with lilac tint, center sometimes dark-brown to yellow-brown, sometimes faintly zonate, 5-8 cm. broad; wet places in woods..... *L. uvidus*.

## III

1. Milk acrid..... 2.  
     Milk mild..... 3.  
 2. Pileus viscid ..... 4.  
     Pileus dry..... **II**.  
 3. Pileus viscid when wet but soon dry, glabrous..... 18.  
     Pileus dry ..... **21**.  
 4. Margin at first involute, tomentose..... 5.  
     Margin naked ..... 6.  
 5. Pileus pale-ochraceous tinged with flesh, sometimes nearly white, usually zonate, with beard-like tomentum persisting on margin, 7-10 cm. broad; gills white or yellowish ..... *L. torminosus*.

- Pileus woolly-tomentose all over, fibrillose on margin, dingy-flesh-colored or reddish-buff, azonate, very viscid in wet weather, 4-10 cm. broad; milk scanty, *sometimes becoming pale-yellow*. ..... *L. cilicioides*.\*
- Pileus olivaceous-umber, yellowish toward margin, agglutinated-villose, or at length glabrous, blackish in drying, 7-15 cm. broad; stem uneven or spotted; gills white, then yellowish, then gray, nearly black where bruised. .... *L. turpis*.
6. Pileus some shade of yellow ..... 7.  
 Pileus some shade of red or fulvous ..... 9.  
 Pileus gray ..... 10.  
 Pileus livid or plum-colored, becoming yellowish, large and firm; stem stout, same color as pileus or paler, not spotted. .... *L. trivialis*.
7. Pileus zonate ..... 8.  
 Pileus azonate, ochraceous, up to 10 cm. broad; spores white; gills tinted yellow. .... *L. affinis*.
8. Pileus 6-11 cm. broad; stem often scrobiculate-spotted; spores yellow. .... *L. insulsus*.\*  
 Pileus 5-8 cm. broad; stem never spotted. .... *L. zonarius*.\*
9. Pileus dull garnet in center, paler toward margin, gluten persisting, 5-8 cm. broad, thin margin inflexed; stem often spotted, paler than pileus; gills white to yellowish. .... *L. hyginus*.  
 Pileus fulvous in center, buff-fulvous toward margin, margin finely crenate; gills white; plants small ..... *L. minusculus*.
10. Pileus cinereus, usually azonate, disk darker, 2-5 cm. broad, thin, fragile; gills close, white; stem often tomentose at base, paler than pileus, up to 8 cm. long. .... *L. cinereus*.  
 Pileus dark gray with lilac tints, zones and disk reddish-brown, fading to pale gray, 6-8 cm. broad; gills close ..... *L. circellatus*.
11. Pileus glabrous ..... 12.  
 Margin with a roll of cottony tomentum, or pileus velvety-tomentose. .... 16.  
 Pileus minutely hirsute-pubescent, or squamulose-tomentose .... 17.  
 Pileus minutely squamulose, ochraceous to fulvous, 2.5-4 cm. broad; gills yellowish to ochraceous. .... *L. alpinus*.
12. Pileus some shade of red ..... 13.  
 Pileus whitish ..... 14.  
 Pileus some shade of gray ..... 15.
13. Pileus reddish-brown or lilac-brown, small, slender; gills close, white or yellowish, dingy-greenish where wounded; on decaying wood. .... *L. parvus*.  
 Pileus bay-red, shining, sometimes floccose-pubescent when young, 5-11 cm. broad; gills ochraceous or reddish; milk very acrid. .... *L. rufus*.\*
14. Pileus umbilicate to infundibuliform, 6-18 cm. broad; stem solid, short, or 2-8 cm. tall; gills very close, dichotomous, arcuate, decurrent ..... *L. piperatus*.\*  
 Pileus thinner than preceding, 5-10 cm. broad; stem 5-10 cm. high; gills adnate, horizontal, white to yellowish. .... *L. pargamentus*.\*
15. Pileus livid-gray, zoned, moist but not viscid, 5-7.5 cm. broad; stem stuffed then hollow; gills thin, distant, subochraceous. .... *L. pyrogalus*.

- Pileus lead-gray or violet-gray, zoned or zoneless, smooth shining, then rivulose-scaly and unpolished, margin flexuose, 5-15 cm. broad; stem solid; gills thick, distant, light-yellowish..... *L. flexuosus*.
16. Pileus convex-umbilicate to infundibuliform, up to 15 cm. broad, surface with the texture of chamois, margin cottony-tomentose ..... *L. deceptivus*.  
Pileus convex to umbilicate, covered with a nap-like tomentum, 5-12 cm. broad; stem stout ..... *L. vellereus*.
17. Pileus hirsute-pubescent, blue-black when young, then zoned with gray, finally yellowish-brown near margin, 5-15 mm. broad; stem short, glabrous; spores cream ..... *L. Bensleyae*.  
Pileus squamulose-tomentose, thin, gray, then brownish-gray azonate; stem tomentose at base, 2.5-6.5 cm. long..... *L. griseus*.
18. Pileus some shade of red..... 19.  
Pileus some other color ..... 20.
19. Pileus and stem mahogany, shining when moist, umbilicate, expanding, but margin arched, about 4 cm. broad..... *L. nitidus*.  
Pileus fulvous, darker in the center, except umbo fading to pinkish, small, fragile ..... *L. oculatus*.
20. Pileus pale alutaceous, azonate, convex-umbilicate, 6-15 cm. broad, margin involute for some time; stem 2.5-6 cm. high; gills close, pallid..... *L. pallidus*.  
Pileus brown, fading, often umbonate, up to 3 cm. broad, margin striatulate; in marshy places ..... *L. paludinellus*.
21. Pileus glabrous ..... 22.  
Pileus pruinose velvety..... 23.  
Pileus rimulose-areolate so as to appear minutely squamulose, brick-red when moist, fading when dry, and surface cracking into minute scale-like areas; gills yellowish, then colored like pileus; milk subwatery; odor and size like *L. camphoratus*..... *L. rimosellus*.
22. Pileus golden-fulvous or brownish-orange, smooth, convex then plane, or slightly depressed, 5-13 cm. broad, surface sometimes cracking; gills white to yellowish, turning brown where injured; odor strong in drying; stout..... *L. volemus*.  
Pileus dark red-brown; stem same color; gills yellow to brick-red; odor sweet; plants small..... *L. camphoratus*.  
Pileus pale-fulvous; gills pallid; milk mild then bitterish; odor none; plants small..... *L. subdulcis*.
23. Pileus fuliginous-brown, umbonate, center wrinkled, 4-10 cm. broad; stem same color; gills distant; spores white, globose, echinulate. .... *L. Gerardii*.  
Pileus yellowish-tawny or brownish-orange, 5-10 cm. broad; gills distant, white or cream; spores broadly elliptical, nearly smooth; stem solid, glabrous or pruinose, 2.5 cm. or more high..... *L. distans*.\*